

**A Course on**

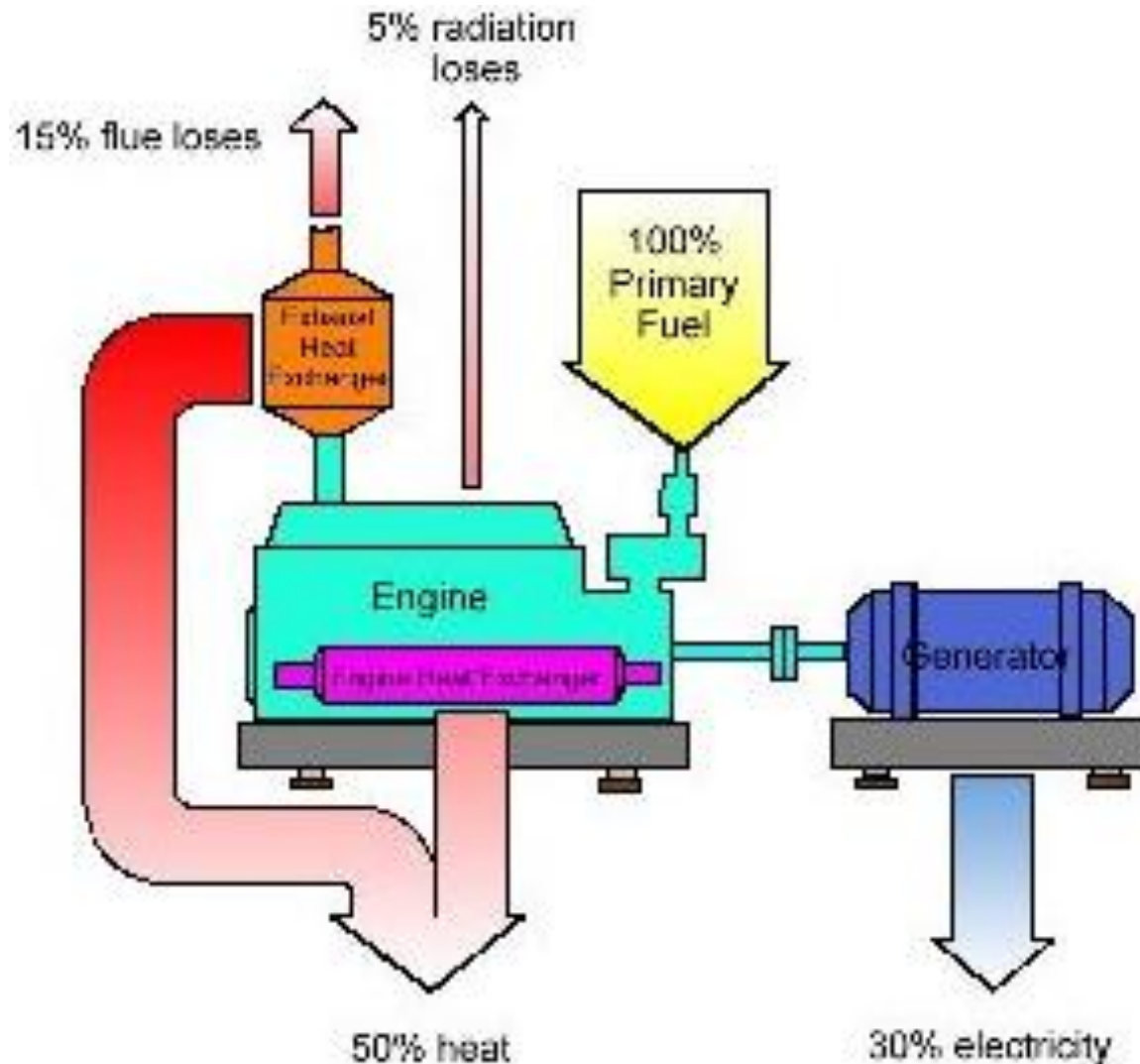
# **Energy Conservation**

**Co-generation**

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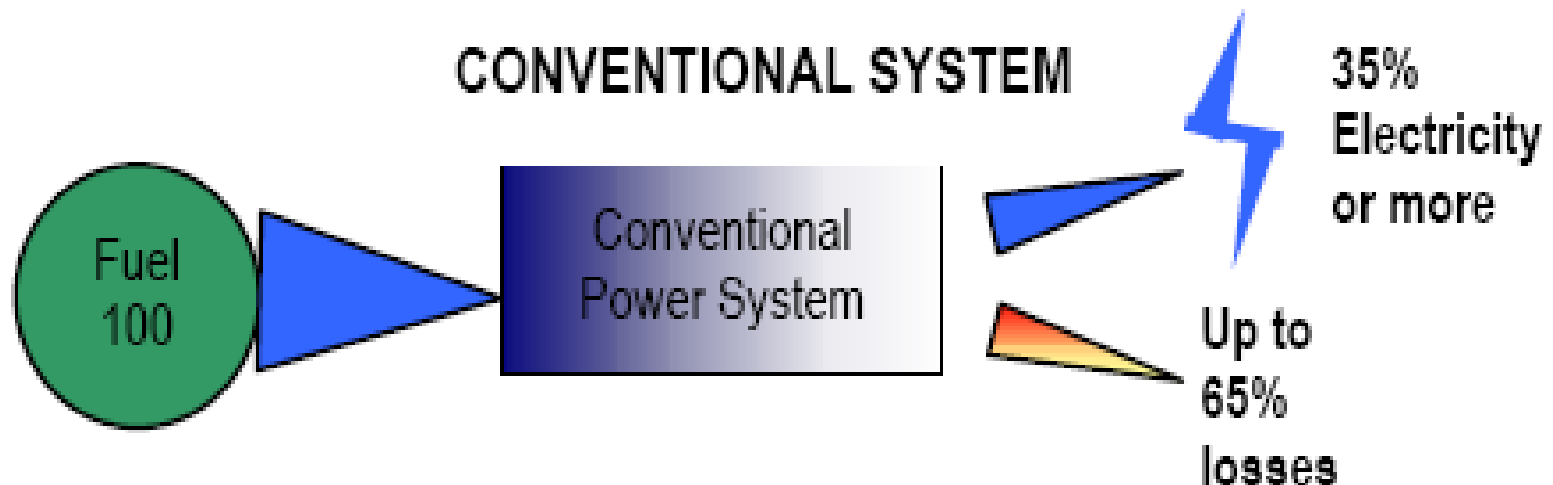
# WHAT IS COGENERATION?



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- ▶ Up to 65% of the energy potential is released as waste heat.
- ▶ Using the waste heat for industry, commerce and home heating/cooling.



# Introduction

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**1- Efficiency can reach 90% or more.**

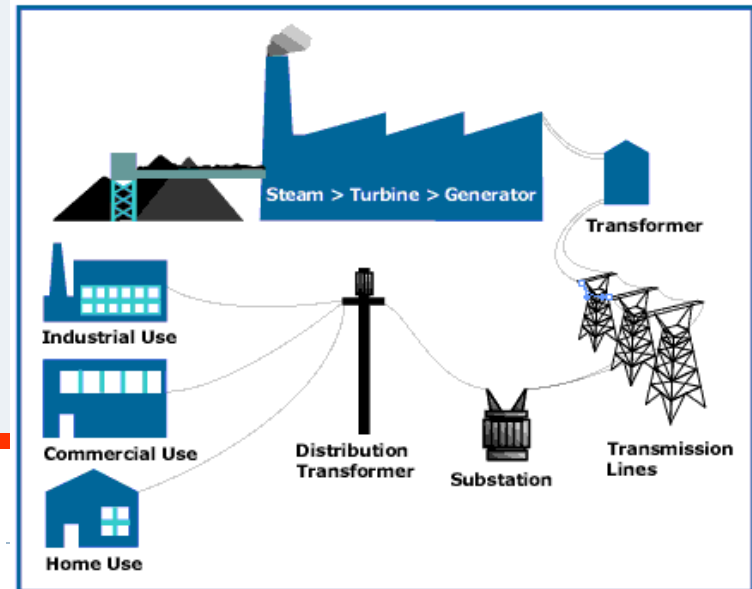
**2- Electricity generated is normally used locally.**



# Introduction

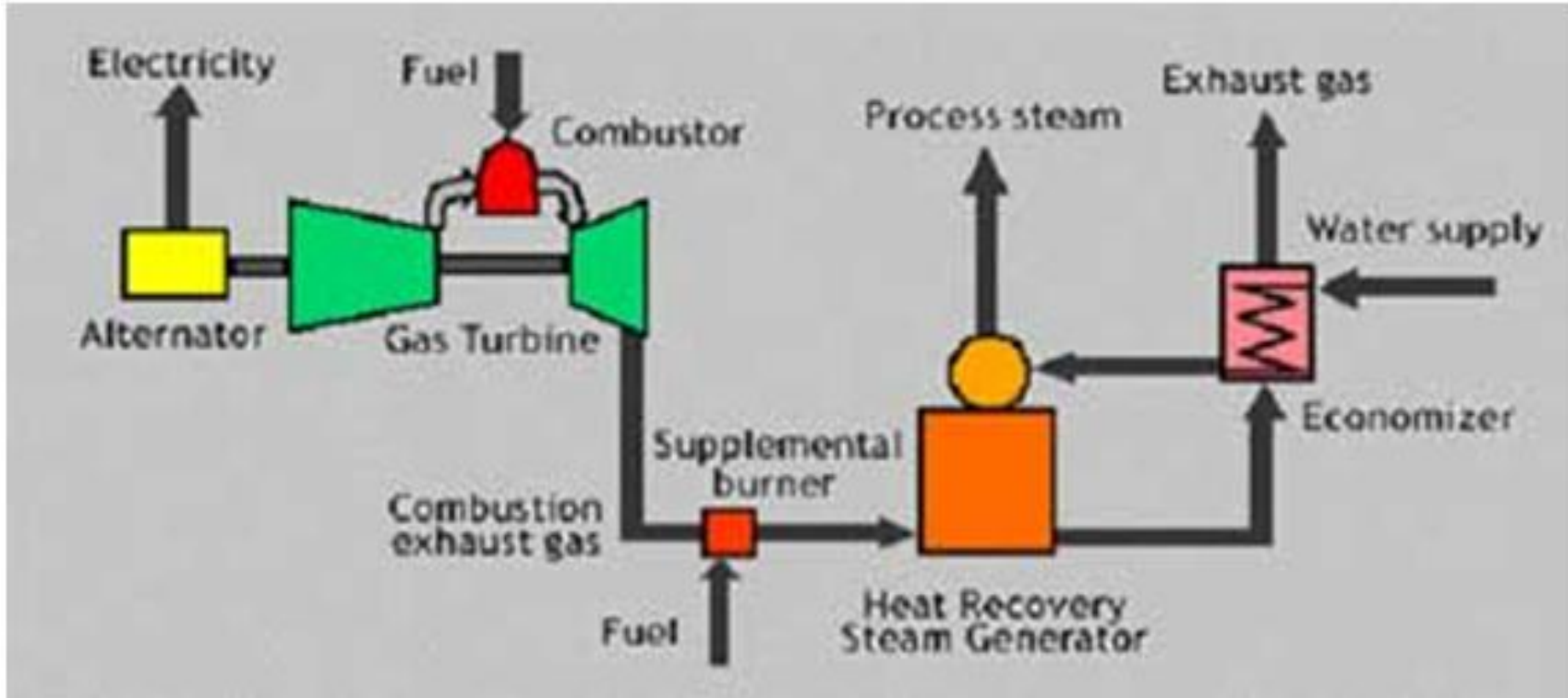
**3- Transmission and distribution losses will be negligible.**

**4- Offers energy savings ranging between 15-40%.**



# Theory

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# Benefits<sub>1</sub>

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## Industrial

- 1- Reduces energy cost
- 2- More reliable power supply
- 3- Improved power supply quality



## Benefits<sub>2</sub>

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## National

- 1- Fewer electricity shortages
- 2- Primary fuel savings
- 3- Enhanced efficiency





# Energy and Cost Savings

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**A well-designed and operated cogeneration scheme will:**

**1- Provide better energy efficiency**

**2- Leads to both energy and cost savings**



# Factors Influencing Viability of Cogeneration Installations<sub>1</sub>

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## 1- High initial costs



## 2- Operating and maintenance costs



# Factors Influencing Viability of Cogeneration Installations<sub>2</sub>

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**3- Careful design and operating optimization**



**4- Possibility of selling surplus power**



# WHERE IS COGENERATION SUITABLE<sub>1</sub>?

***Industrial***



**Pharmaceuticals**



**Paper and board**



**Cement**



**Ceramics**



**Food processing**

**etc.**



# WHERE IS COGENERATION SUITABLE<sub>2</sub>?

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## *Buildings*



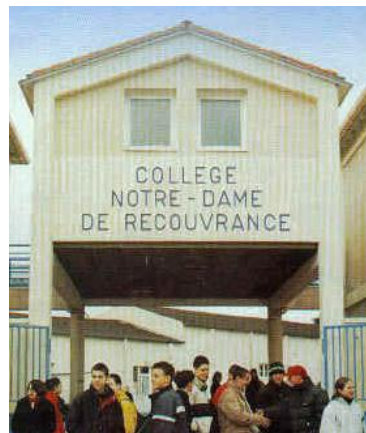
**Hotels**



**Airports**



**Hospitals**



**College and schools**



**Swimming pools**

**etc.**

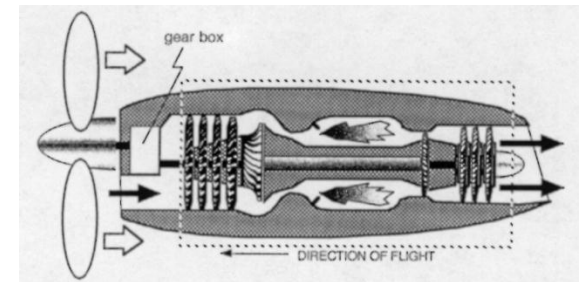
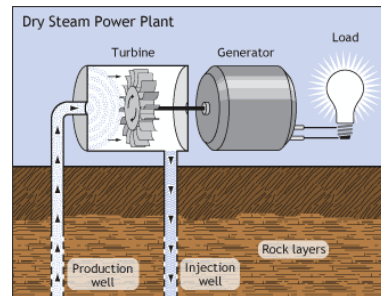
# A COGENERATION PLANT CONSISTS OF

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## 1- A prime mover



Steam turbine



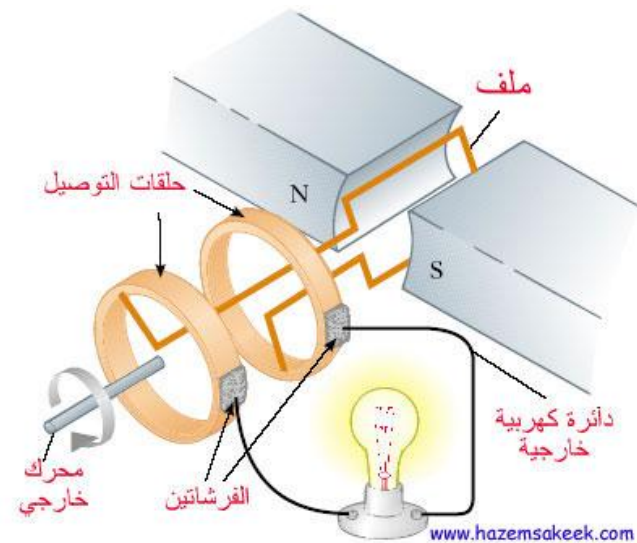
Gas turbine

Reciprocating engine



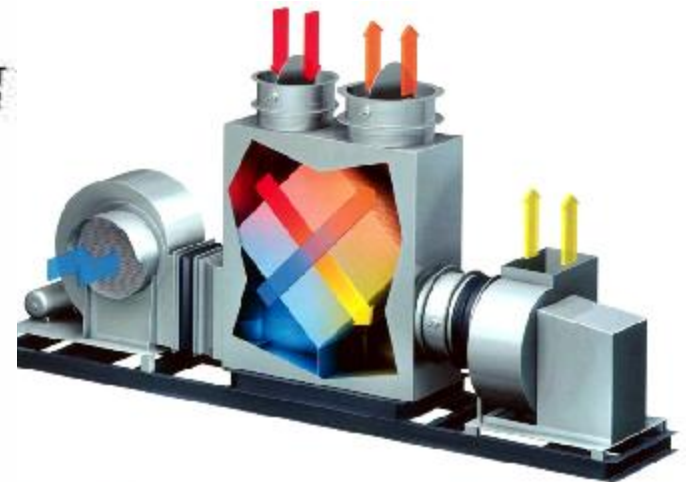
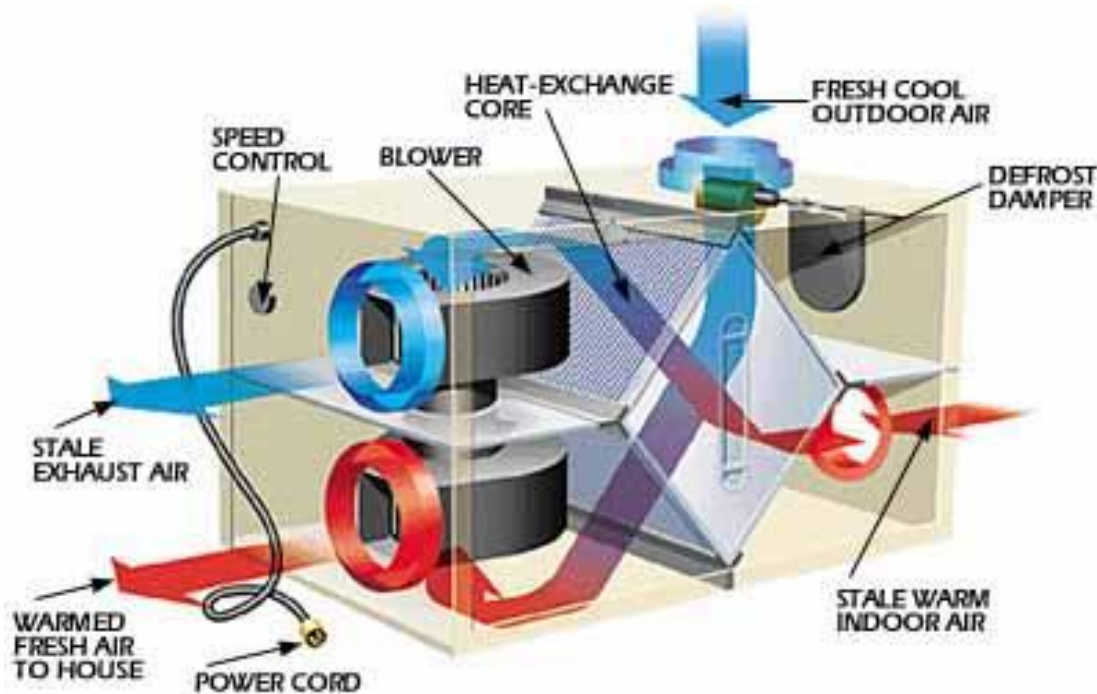
# A COGENERATION PLANT CONSISTS OF

## 2- An electricity generator



# A COGENERATION PLANT CONSISTS OF

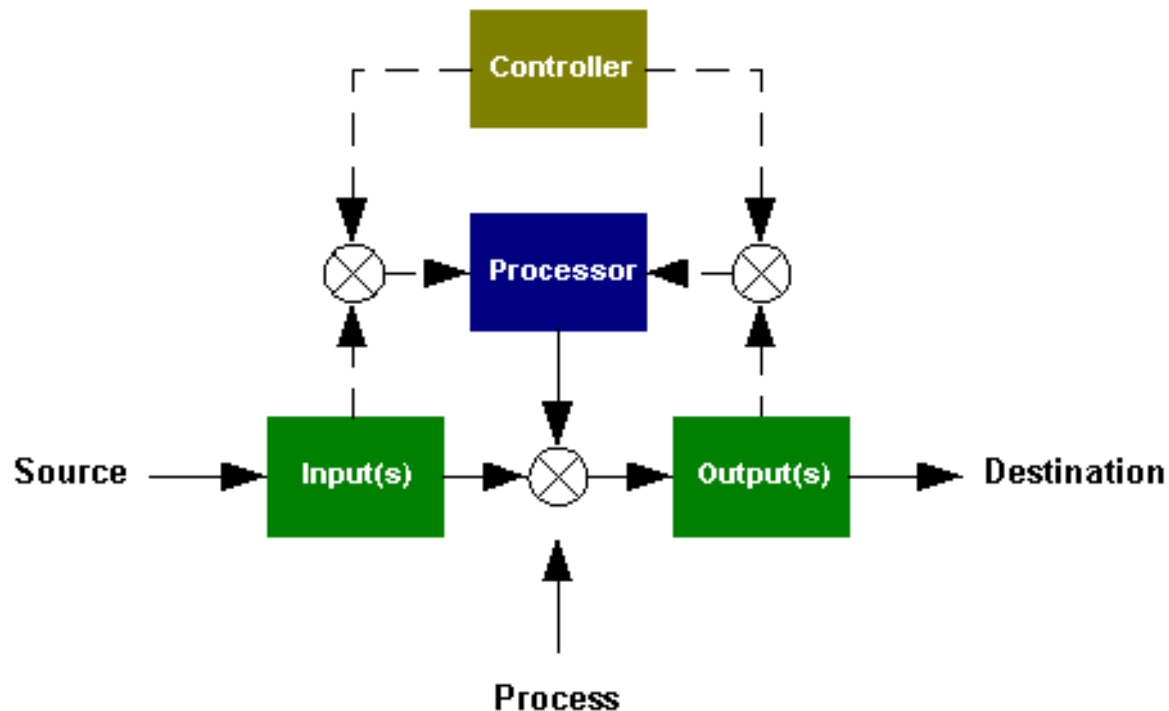
## 3- A heat recovery system





# A COGENERATION PLANT CONSISTS OF

## 4- A control system



# **CAPITAL COST**

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- **Cogeneration unit(s) and associated plant.**
  - **Fuel supply, storage and handling.**
  - **Connection charges including local/national electricity networks.**
  - **All associated mechanical and electrical services.**
  - **Any new buildings, modification to existing buildings.**
  - **Operator training, first set of spare parts and any special tools.**
  - **Engineering design.**
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# OPERATING COST

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- Fuel.
- Labour.
- Maintenance.
- Consumables,  
e.g. lubricating oil, feed-water treatment.
- Chemicals, cooling tower dosing.
- Back-up electricity prices.



# FACTORS SHORTENING PAYBACK PERIODS

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- Low investment cost.
- Low fuel price.
- High electricity price.
- Minimum cogeneration fuel price.
- High annual operating hours.
- High overall thermal efficiency.



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**Thank  
you**

**Any  
questions?**



**Estimate the expected drinking water ( $\text{m}^3/\text{hr}$ ) generated by implementing a cogeneration system in a diesel generator as shown.**

